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DISTRIBUTION OF LITTORELLA AMERICANA IN THE MID-ARROWHEAD REGION OF MINNESOTA

OLGA LAKELA

Professor Fernald in separating *L. americana* from *L. uniflora* (L.) Asch.¹ refers to the plant as one of the rarest in North America, known only from a few localities throughout its range from Newfoundland to Minnesota. Until recently the collection of L. H. Bailey, no. 437, Basswood Lake, July 28, 1886 appears to have been the only record from the state.

L. americana first came to my attention while I was collecting in the "Roadless Area" of St. Louis County. Plants without flowers or fruit (no. 16743, August 9, 1953) were collected from a submersed colony with *Lobelia Dortmanna*, growing on a sandy bottom in shallow shorewaters of Iron Lake on the Ontario border. On the following day it was found again in Lac La Croix, at Beatty portage from Loon Lake. Plants in vegetative condition, no. 16756, were collected from a colony submersed in shallow water, again associated with *L. Dortmanna*. In each site the bottom soil was mostly a mixture of gray sand with black organic soil, peaty or mucky. Identification of the species in vegetative condition remained doubtful until 1957. In dealing with the known flora from Lake County for the manuscript of a *Flora of the Mid-Arrowhead Region*, Bailey's early collection of flowering plants was studied. This decisively cleared the identity of the sterile specimens.

In the ensuing search for additional flowering material in late season Basswood Lake seemed most accessible. Working from

¹ RHODORA 20: 61-62. 1918. *The North American Littorella*.

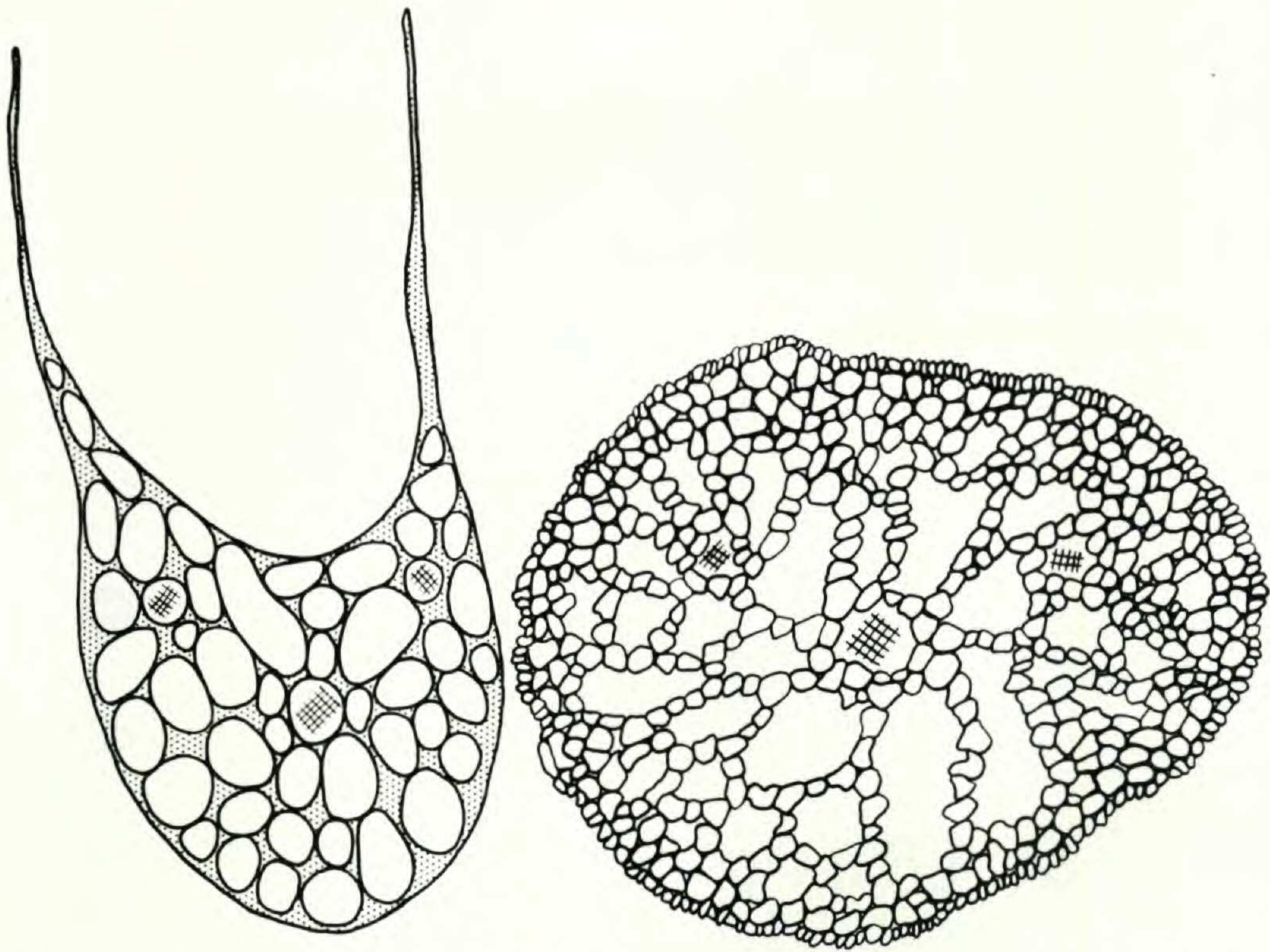
the Quetico-Superior Wilderness Research Center at Basswood Lake, after an extensive fruitless search of the more distant shores, *Littorella* was sighted without effort in the "home harbor" shore of the Center bay near the boat docks. The compact colony growing in silty sand was stranded above the water level. The associate species was *Ranunculus repens*. Coll. no. 22417, Sept. 10, 1957, consists of plants in late anthesis, with some mature fruits.

The label data of Bailey's collection lacks a specific location on Basswood Lake. The finding of the species there again temptingly invites one to visualize Dr. Bailey towering over the spot preferred by a persistent colony of *Littorella*. However, in reality, the occurrence of a solitary colony on a lake with several hundreds of miles shoreline is presumptuous.

L. americana was encountered again in Snow Bank Lake, located in the north central part of Lake County, about three miles south of the Canadian border. Here, in peaty sand of shallow waters of the bay south of the Resort, *Subularia aquatica*, in late flower and fruit, occurred in abundance with *Isoetes muricata*. Farther south in an adjoining bay some dozen plants of *Nymphaea tuberosa* were in full flower. Not far from the latter site on the sandy shore was an emersed colony of sterile *Littorella*, no. 22492 Sept. 14, 1957. Perhaps it was the stranded part of a much larger submersed colony 5-10 feet from the beach at a water-depth of 2-3 feet which covered square yards of the sandy, cobblestone strewn bottom. The plants were clearly visible in the early morning sun, but almost beyond the reach of the collecting tool. Only a few plants dislodged from the seemingly hardened sediment floated to the surface with fragments of *Myriophyllum tenellum*.

It may be permissible to state here that botanizing is catching. On finding *Littorella* at the Quetico-Superior Research Center, the plants were shown to Mr. Otto Oltman, foreman, with a request that he try to find and collect the species during an anticipated canoe trip through the wilderness canoe country. His collection of *Littorella*, from the shore of an island in Malberg Lake about 4 miles west of Cook County, Sec. 8, T. 63, R. 6 W, September 19, 1957, was a welcome contribution to knowledge of this little known species. Thus within a space of a week,

three new localities were discovered. The Ontario site in the accompanying map is based on a sight record made September 2, 1956; circumstances prevented collecting at the time. The colony may be found on the shore of a small bay connected with Crooked Lake by a narrow channel, opposite Curtain Falls Resort Area.



LITTORELLA AMERICANA. Fig. 1, at left, sheathing leaf-base, $\times 30$; tissues stippled, clear areas air-chambers or lacunae, vascular traces cross-hatched.

Fig. 2, at right, cross section of leaf near the middle, $\times 50$; cells in outline only; epidermis without chlorophyll; (elongate cells with straight walls in face view not shown); stomata numerous throughout; mesophyll spongy with radial lacunae; traces cross-hatched.

In studying living plants of *Littorella* discrepancies in descriptions of leaves by different authors came to my attention. According to N. C. Fassett,² the leaves are "rather stiff dark thread-like." H. A. Gleason³ notes their shape as "linear." In his illustration of the plant as a whole, they are depicted as being flat and thin. Professor Fernald features leaf morphology as one of the diagnostic differences between the American and European

² Manual of Aquatic Plants p. 313-314, 1940.

³ The New Britton and Brown Illustrated Flora of the United States and Canada Vol. 3, p. 273, 1952.

species. In describing *L. americana*, he observed the leaves as "flattish, falcate-arcuate or straightish"; in *L. uniflora*, as "subterete or semi-cylindric."

It may not be amiss to place on record another description based on the study of living plants from five different localities. Mature fully turgid leaves are subulate, falcate-arcuate, lustrous,

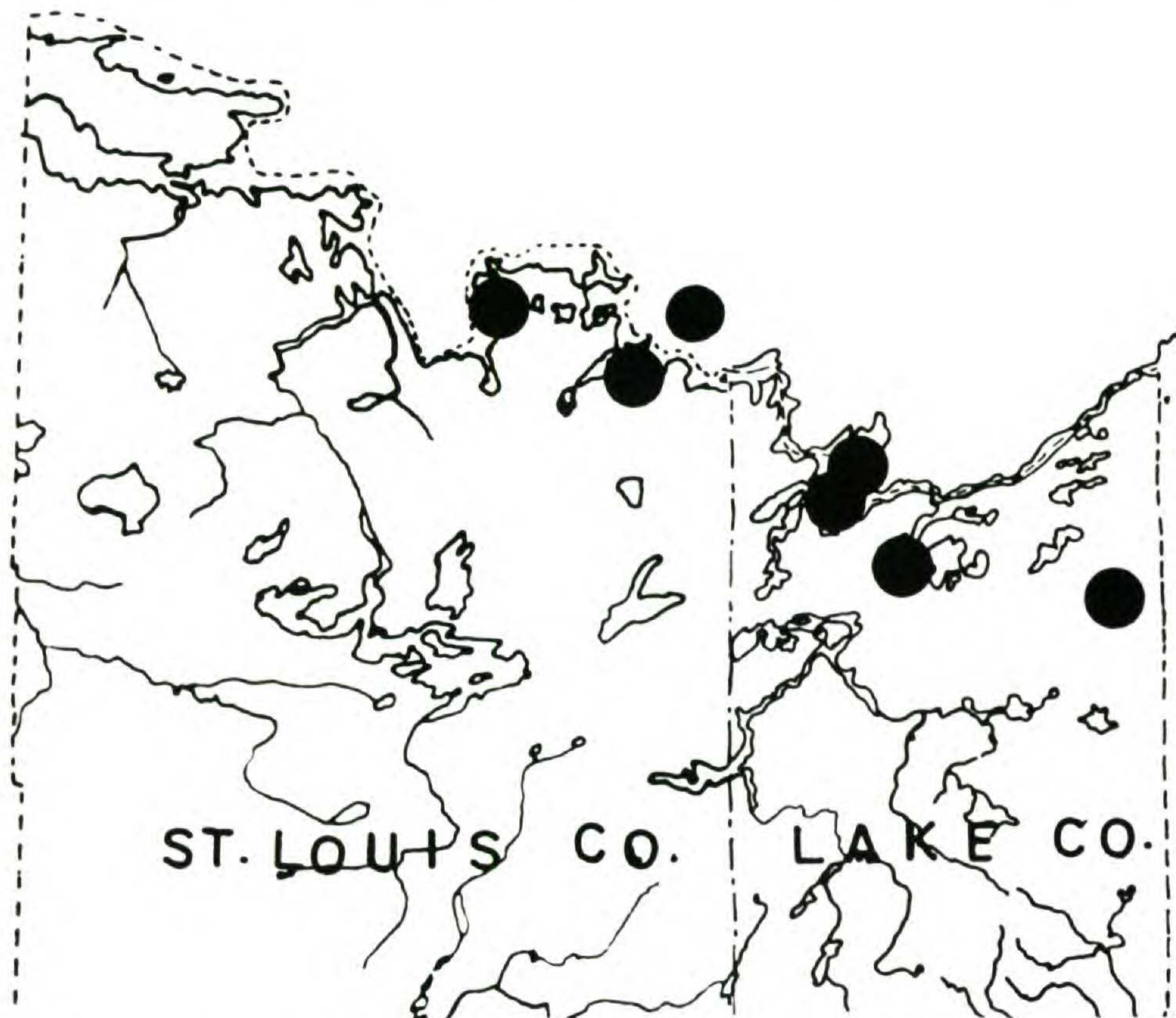


Fig. 3. The known sites of *Littorella americana*, in the upper portions of St. Louis and Lake Counties, mid-Arrowhead Region, Northeastern Minnesota.

bright green to yellowish green above the white bases. The blade distally above the shallow groove of the sheathing leaf-base, feels and looks terete, firm and pliable. The rich green tips of young leaves, two in alternate succession, embraced within the scarious-margined bases of opposing mature leaves are somewhat compressed but soon become subulate. Microscopically the mature leaves are nearly terete or at least more than semi-circular with concentric mesophyll centered about the median trace. The large air chambers appear to be radial; the two smaller traces are elevated above the median plane, cf. fig. 1 & 2.

Although *Littorella uniflora*, the European species has not been studied, descriptions of its leaves as, "subterete or semi-cylindric" indicates a similarity to those of *L. americana*. Otherwise, in floral structures and size Minnesota plants well agree with Fernald's descriptions. The purplish-black fruit in maturity appears terete, apiculate with a short stipe and a minutely rugose pericarp.

Plants collected in late October show yellowing and gradual decay of the older leaves. Under greenhouse conditions the young leaves continue growth. The renewed overwintering rhizome of the season is 2–3 mm. thick and about as long; rhizomes of the previous years are persistent, subject to gradual decay. Whether the plants are stranded or submersed, they are readily recognized in field studies. The terete-appearing leaves, 1–2.2 mm. thick near the midpoint cannot be confused with *Ranunculus repens*.² Their outwardly-arching habit sets them apart from the linear-compressed obtuse leaves of *Lobelia Dortmanna*, which are broadly elliptic in cross-section, with two lacunae flanking the median trace.

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UNIVERSITY OF MINNESOTA, DULUTH BRANCH.

EXPERIMENTS AND OBSERVATIONS BEARING ON EVOLUTION IN OENOTHERA

R. RUGGLES GATES¹

I

During an examination of the collections of *Oenothera* in the Gray Herbarium, Harvard University (Gates, 1957), a new species *Oe. perangusta* (Gates, 1950) was described from the North shore of Lake Superior. One specimen in the collection from Jackfish Station differed from the rest in having deep red stems and buds. It was recognized as a mutation parallel to the red-budded mutation from *Oe. Lamarckiana* (Gates, 1911)

¹ Cambridge, Mass.